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SEAT NO :

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

PMT0301 – MATHEMATICS III

(All sections / Groups)

3 OCTOBER 2022
9.00am – 11.00am
(2 Hours)

Question	Marks
1	
2	
3	
Total	

INSTRUCTIONS TO STUDENT

1. This question paper consists of 10 printed pages excluding cover page, formulae and statistical table.
2. Attempt **ALL THREE** questions. The distribution of the marks for each question is given.
3. Please write your answers in the **QUESTION BOOKLET**.
4. All necessary working steps **MUST** be shown to obtain maximum marks.

QUESTION 1 (15 MARKS)

- (a) Find the sum of the geometric series $1 + 3 + 9 + \dots + 6561$. [3 marks]

- (b) Find the term containing x^3y^6 in the expansion of $(3x - y)^9$. Simplify your answer to the simplest form. [2 marks]

Continued...

(c) Given the following system of linear equations:

$$x + y + z = 9$$

$$2x + y + 3z = 19$$

$$x + 5y + 3z = 29$$

If $\frac{1}{-6} \begin{bmatrix} -12 & 2 & 2 \\ -3 & 2 & -1 \\ 9 & -4 & -1 \end{bmatrix}$ is the inverse matrix for the above system, find the value for

x, y and z .

[3 marks]

Continued...

- (d) Solve the system of linear equations with Gauss-Jordan Elimination method. Use forward phase followed by backward phase.

$$\begin{aligned}x + 2y - z &= 2 \\3x + 4y - 3z &= -2 \\3y - 2z &= 4\end{aligned}$$

[7 marks]

Continued...

QUESTION 2 (15 MARKS)

- (a) Find the point at which the line with parametric equations $x = 1 - 3t$, $y = 2t$, and $z = 1 - t$ intersects the plane $2x + y - z = -5$. [4 marks]

- (b) Find the symmetric equations of the line passing through the point $(5, -2, 3)$ that is parallel to $2\mathbf{i} + 4\mathbf{j} - 5\mathbf{k}$. [2 marks]

Continued...

(c) Given the following sample data:

8	12	13	8	10	17	11	10
6	8	8	10	15	13	19	9

Calculate the

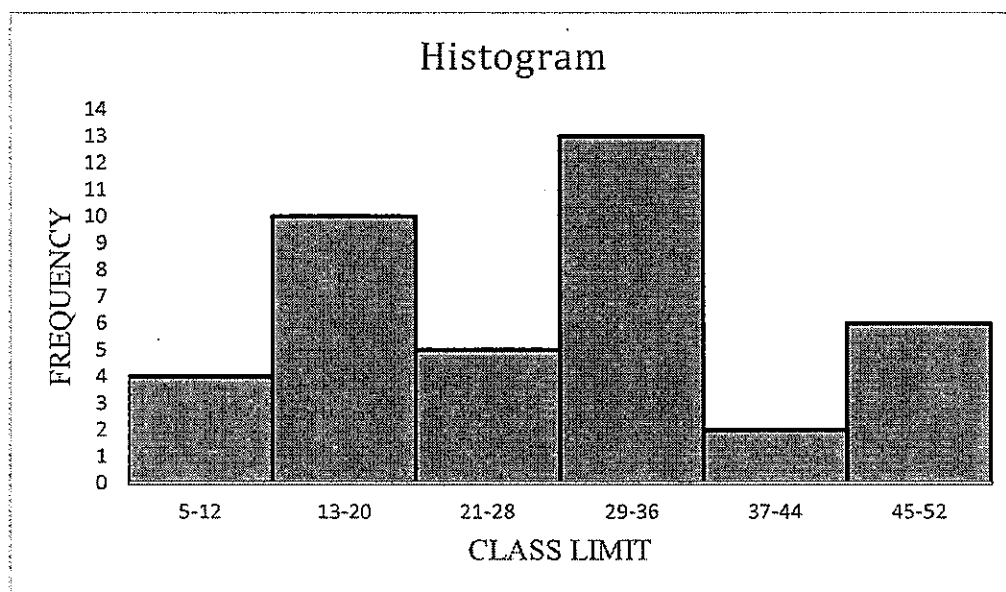
- (i) mean
- (ii) median
- (iii) mode
- (iv) standard deviation.

Give your answer correct to 2 decimal places.

[6 marks]

Continued...

- (d) Below is the histogram for the time spent (in minutes) by a random sample of 40 students in MMU library.



Calculate the mode using formula. Correct your answer to 2 decimal places.

[3 marks]

Continued...

QUESTION 3 (20 MARKS)

- (a) Two cards are drawn one by one (without replacement) from a deck of 52 playing cards. What is the probability that both cards are greater than 3 and less than 9? [2 marks]

- (b) An aquarium contains six black and five red goldfishes. If four goldfishes are selected at random from the aquarium, what is the probability that at least one of the goldfishes selected is red? [3 marks]

Continued...

- (c) A random sample of 200 adults are classified below by gender and their level of agreement towards a statement X .

Education	Male (M)	Female (F)
Strongly agree (SA)	13	9
Agree (A)	38	45
Disagree (D)	15	50
Strongly disagree (SD)	20	10

If a person is selected at random from this group, find the probability that

- (i) the person is a male and strongly agree with statement X .
- (ii) the person is a male, given that the person disagree with statement X
- (iii) the person strongly disagree with statement X , given that the person is a female.

[5 marks]

Continued...

- (d) A study shows that 15% of the population in a country wear spectacles. A random sample of 20 persons is selected from this country.
- (i) Find the probability that at least 2 persons in this sample wear spectacles.
 - (ii) What is the mean and standard deviation of the number of persons who wear spectacles?

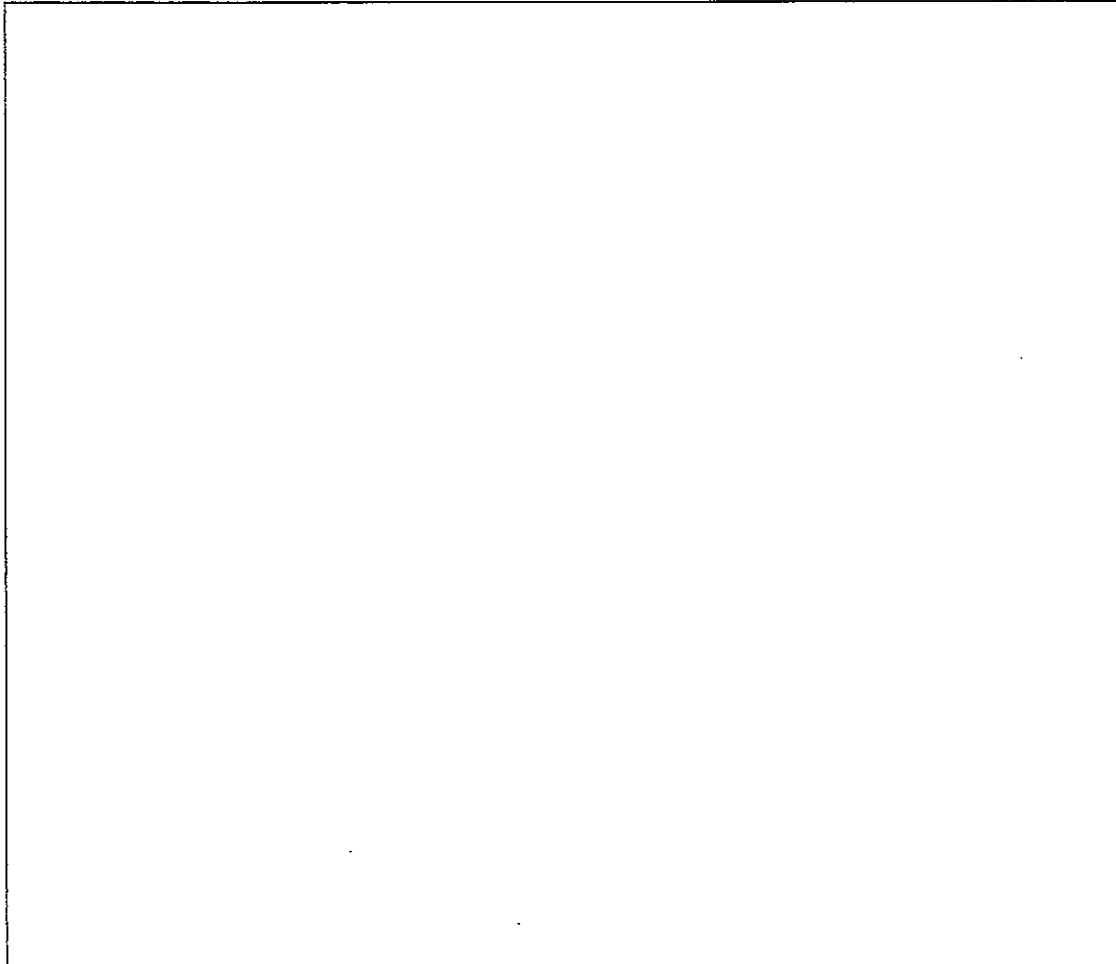
[3 marks]

- (e) An electrical retailer owner knows that on average, the sale for a particular item is 5 units per day. What is the probability that,
- (i) the sale for this item is at least one unit in a day?
 - (ii) the sale for this item is 5 units in 2 days?

[4 marks]

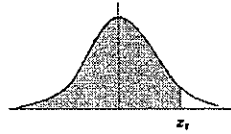
Continued...

- (f) The length of an item is normally distributed with a mean of 165cm and a standard deviation of 5cm. What is the probability that a randomly selected item will have a length between 152cm and 168cm? [3 marks]



End of Page

Standard Normal Distribution



$$p(z \leq z_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_1} e^{-\frac{1}{2}z^2} dz$$

The Normal Distribution Function

x	Φ(x)	x	Φ(x)	x	Φ(x)	x	Φ(x)
0.00	0.5000	0.50	0.6915	1.00	0.8413	1.50	0.9332
0.01	0.5040	0.51	0.6950	1.01	0.8438	1.51	0.9345
0.02	0.5080	0.52	0.6985	1.02	0.8461	1.52	0.9357
0.03	0.5120	0.53	0.7019	1.03	0.8485	1.53	0.9370
0.04	0.5160	0.54	0.7054	1.04	0.8508	1.54	0.9382
0.05	0.5199	0.55	0.7088	1.05	0.8531	1.55	0.9394
0.06	0.5239	0.56	0.7123	1.06	0.8554	1.56	0.9406
0.07	0.5279	0.57	0.7157	1.07	0.8577	1.57	0.9418
0.08	0.5319	0.58	0.7190	1.08	0.8599	1.58	0.9429
0.09	0.5359	0.59	0.7224	1.09	0.8621	1.59	0.9441
0.10	0.5398	0.60	0.7257	1.10	0.8643	1.60	0.9452
0.11	0.5438	0.61	0.7291	1.11	0.8665	1.61	0.9463
0.12	0.5478	0.62	0.7324	1.12	0.8686	1.62	0.9474
0.13	0.5517	0.63	0.7357	1.13	0.8708	1.63	0.9484
0.14	0.5557	0.64	0.7389	1.14	0.8729	1.64	0.9495
0.15	0.5596	0.65	0.7422	1.15	0.8749	1.65	0.9505
0.16	0.5636	0.66	0.7454	1.16	0.8770	1.66	0.9515
0.17	0.5675	0.67	0.7486	1.17	0.8790	1.67	0.9525
0.18	0.5714	0.68	0.7517	1.18	0.8810	1.68	0.9535
0.19	0.5753	0.69	0.7549	1.19	0.8830	1.69	0.9545
0.20	0.5793	0.70	0.7580	1.20	0.8849	1.70	0.9554
0.21	0.5832	0.71	0.7611	1.21	0.8869	1.71	0.9564
0.22	0.5871	0.72	0.7642	1.22	0.8888	1.72	0.9573
0.23	0.5910	0.73	0.7673	1.23	0.8907	1.73	0.9582
0.24	0.5948	0.74	0.7704	1.24	0.8925	1.74	0.9591
0.25	0.5987	0.75	0.7734	1.25	0.8944	1.75	0.9599
0.26	0.6026	0.76	0.7764	1.26	0.8962	1.76	0.9608
0.27	0.6064	0.77	0.7794	1.27	0.8980	1.77	0.9616
0.28	0.6103	0.78	0.7823	1.28	0.8997	1.78	0.9625
0.29	0.6141	0.79	0.7852	1.29	0.9015	1.79	0.9633
0.30	0.6179	0.80	0.7881	1.30	0.9032	1.80	0.9641
0.31	0.6217	0.81	0.7910	1.31	0.9049	1.81	0.9649
0.32	0.6255	0.82	0.7939	1.32	0.9066	1.82	0.9656
0.33	0.6293	0.83	0.7967	1.33	0.9082	1.83	0.9664
0.34	0.6331	0.84	0.7995	1.34	0.9099	1.84	0.9671
0.35	0.6368	0.85	0.8023	1.35	0.9115	1.85	0.9678
0.36	0.6406	0.86	0.8051	1.36	0.9131	1.86	0.9686
0.37	0.6443	0.87	0.8078	1.37	0.9147	1.87	0.9693
0.38	0.6480	0.88	0.8106	1.38	0.9162	1.88	0.9699
0.39	0.6517	0.89	0.8133	1.39	0.9177	1.89	0.9706
0.40	0.6554	0.90	0.8159	1.40	0.9192	1.90	0.9713
0.41	0.6591	0.91	0.8186	1.41	0.9207	1.91	0.9719
0.42	0.6628	0.92	0.8212	1.42	0.9222	1.92	0.9726
0.43	0.6664	0.93	0.8238	1.43	0.9236	1.93	0.9732
0.44	0.6700	0.94	0.8264	1.44	0.9251	1.94	0.9738
0.45	0.6736	0.95	0.8289	1.45	0.9265	1.95	0.9744
0.46	0.6772	0.96	0.8315	1.46	0.9279	1.96	0.9750
0.47	0.6808	0.97	0.8340	1.47	0.9292	1.97	0.9756
0.48	0.6844	0.98	0.8365	1.48	0.9306	1.98	0.9761
0.49	0.6879	0.99	0.8389	1.49	0.9319	1.99	0.9767
0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772

x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
2.00	0.97725	2.50	0.99379	3.00	0.99865	3.50	0.99977
2.01	0.97778	2.51	0.99396	3.01	0.99869	3.51	0.99978
2.02	0.97831	2.52	0.99413	3.02	0.99874	3.52	0.99978
2.03	0.97882	2.53	0.99430	3.03	0.99878	3.53	0.99979
2.04	0.97932	2.54	0.99446	3.04	0.99882	3.54	0.99980
2.05	0.97982	2.55	0.99461	3.05	0.99886	3.55	0.99981
2.06	0.98030	2.56	0.99477	3.06	0.99889	3.56	0.99981
2.07	0.98077	2.57	0.99492	3.07	0.99893	3.57	0.99982
2.08	0.98124	2.58	0.99506	3.08	0.99896	3.58	0.99983
2.09	0.98169	2.59	0.99520	3.09	0.99900	3.59	0.99983
2.10	0.98214	2.60	0.99534	3.10	0.99903	3.60	0.99984
2.11	0.98257	2.61	0.99547	3.11	0.99906	3.61	0.99985
2.12	0.98300	2.62	0.99560	3.12	0.99910	3.62	0.99985
2.13	0.98341	2.63	0.99573	3.13	0.99913	3.63	0.99986
2.14	0.98382	2.64	0.99585	3.14	0.99916	3.64	0.99986
2.15	0.98422	2.65	0.99598	3.15	0.99918	3.65	0.99987
2.16	0.98461	2.66	0.99609	3.16	0.99921	3.66	0.99987
2.17	0.98500	2.67	0.99621	3.17	0.99924	3.67	0.99988
2.18	0.98537	2.68	0.99632	3.18	0.99926	3.68	0.99988
2.19	0.98574	2.69	0.99643	3.19	0.99929	3.69	0.99989
2.20	0.98610	2.70	0.99653	3.20	0.99931	3.70	0.99989
2.21	0.98645	2.71	0.99664	3.21	0.99934	3.71	0.99990
2.22	0.98679	2.72	0.99674	3.22	0.99936	3.72	0.99990
2.23	0.98713	2.73	0.99683	3.23	0.99938	3.73	0.99990
2.24	0.98745	2.74	0.99693	3.24	0.99940	3.74	0.99991
2.25	0.98778	2.75	0.99702	3.25	0.99942	3.75	0.99991
2.26	0.98809	2.76	0.99711	3.26	0.99944	3.76	0.99992
2.27	0.98840	2.77	0.99720	3.27	0.99946	3.77	0.99992
2.28	0.98870	2.78	0.99728	3.28	0.99948	3.78	0.99992
2.29	0.98899	2.79	0.99736	3.29	0.99950	3.79	0.99992
2.30	0.98928	2.80	0.99744	3.30	0.99952	3.80	0.99993
2.31	0.98956	2.81	0.99752	3.31	0.99953	3.81	0.99993
2.32	0.98983	2.82	0.99760	3.32	0.99955	3.82	0.99993
2.33	0.99010	2.83	0.99767	3.33	0.99957	3.83	0.99994
2.34	0.99036	2.84	0.99774	3.34	0.99958	3.84	0.99994
2.35	0.99061	2.85	0.99781	3.35	0.99960	3.85	0.99994
2.36	0.99086	2.86	0.99788	3.36	0.99961	3.86	0.99994
2.37	0.99111	2.87	0.99795	3.37	0.99962	3.87	0.99995
2.38	0.99134	2.88	0.99801	3.38	0.99964	3.88	0.99995
2.39	0.99158	2.89	0.99807	3.39	0.99965	3.89	0.99995
2.40	0.99180	2.90	0.99813	3.40	0.99966	3.90	0.99995
2.41	0.99202	2.91	0.99819	3.41	0.99968	3.91	0.99995
2.42	0.99224	2.92	0.99825	3.42	0.99969	3.92	0.99996
2.43	0.99245	2.93	0.99831	3.43	0.99970	3.93	0.99996
2.44	0.99266	2.94	0.99836	3.44	0.99971	3.94	0.99996
2.45	0.99286	2.95	0.99841	3.45	0.99972	3.95	0.99996
2.46	0.99305	2.96	0.99846	3.46	0.99973	3.96	0.99996
2.47	0.99324	2.97	0.99851	3.47	0.99974	3.97	0.99996
2.48	0.99343	2.98	0.99856	3.48	0.99975	3.98	0.99997
2.49	0.99361	2.99	0.99861	3.49	0.99976	3.99	0.99997
2.50	0.99379	3.00	0.99865	3.50	0.99977	4.00	0.99997

PMT0301: FORMULAE

$$\mu = \frac{\sum x}{N}$$

$$\bar{x} = \frac{\sum x}{n} = \frac{\sum mf}{n}$$

$$\sigma^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N} = \frac{\sum m^2 f - \frac{(\sum mf)^2}{N}}{N}$$

$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1} = \frac{\sum m^2 f - \frac{(\sum mf)^2}{n}}{n-1}$$

$$\text{Mode} = L + \left[\frac{f_m - f_B}{(f_m - f_B) + (f_m - f_A)} \right] c$$

$$\text{Median} = L + \left[\frac{\left[\frac{\sum f}{2} \right] - F_L}{f_m} \right] c$$

$$\text{Binomial Distribution : } P(X = x) = \binom{n}{x} p^x q^{n-x}, x=0,1,2,\dots,n$$

$$\text{Poisson Distribution : } P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}, x=0,1,2,\dots$$

$$\text{Normal Distribution : } Z = \frac{x - \mu}{\sigma}$$

